Abstract: QA/QC implementation in real world gamma spectroscopy systems

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During recent years, quality control and quality assurance have gained increased attention from the operators of analytical equipment. The gamma spectrometer systems of today are not significantly different from those that have been employed for a number of years. However, the increased emphasis on quality assurance record keeping by regulators and radioanalysis laboratory customers and the improved database technology for storing large amounts of data that is available today have made it necessary and possible for effective QA software to be a key part of any count room. Electronic storage of the data is the easy part. Knowing what parameters to track, what types of QA tests to use and how interpret the QA results is more difficult and is critical to having a good QA/QC program. Since most operators of analytical instruments are audited on regular basis, a good QA record keeping package must make data readily-accessible and easily defensible.

Today, many kinds of QA database packages are available for the various types of analytical instrumentation. Each instrument has its own specific types of parameters that need to be monitored to maintain peak performance. Gamma spectroscopy systems are instruments designed to qualitatively and quantitatively measure the gamma emission from radioactive materials. Parameters that need to be monitored for these types of systems relate to the detector and its associated electronics.

Basically, gamma spectroscopy systems are designed to measure extremely low to relatively high quantities of radioactive material, and the key quality assurance task is to ensure that the instrument's performance is stable before, during and even after analysis of unknown samples. A good QA software package should ensure that the user knows if performance of the instrument has changed since the last efficiency calibration so that corrective action may be taken as soon as possible. As an example, measuring the same source in the same conditions should report the same radioactivity over time (accounting for decay). However, this single parameter approach has limitations and is insufficient to show what caused an eventual exception situation.

What we present here is additional parameters that should be monitored in order to maintain a gamma spectroscopy system at peak performance over the equipment's lifetime. Data from these parameters give early warnings as to possible problems with the system as well as information for troubleshooting the problems.

The information presented is based on years of intensive cooperation between many users of electronic QA packages and consultancy work performed by CANBERRA to help customers successfully pass their audits and achieve accreditations for their counting laboratories. The goal is to provide advice as to how to create an accurate and balanced QA program which can alert the user to any situation that may cause the system to report erroneous results.